

Ten-Year-Old Child Test Dummy



Hybrid III Type

Problem



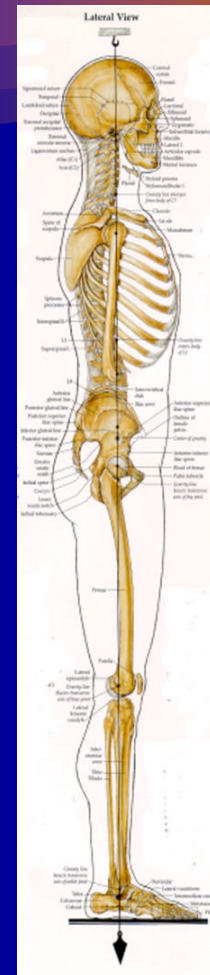
- Current 213 covers children up to 6-y-o and 208 starts with small females
- Unaddressed - a large population segment (approx. 10%) between 6-y-o and children approximating the size of small female
- Too big for CRS and borderline for adult restraints
- Laws require use of belts or CRS
- Also exposed to air bags and as pedestrians
- Test tool is needed to evaluate and certify adequacy of available protection systems

Height and Weight of U.S. Population and Comparable Dummies

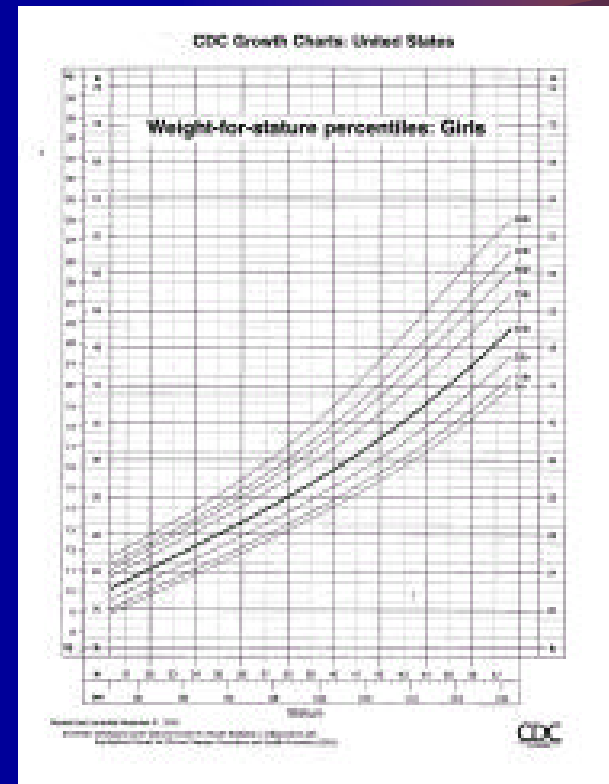
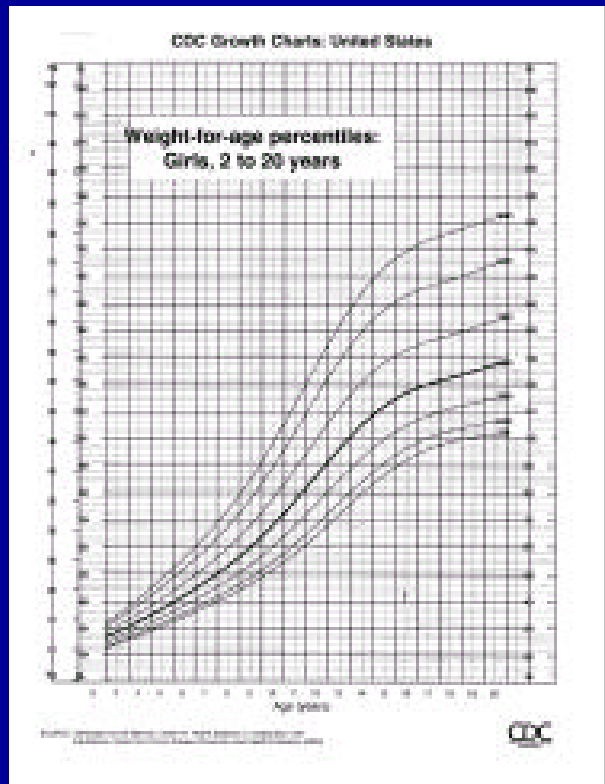
	Standing Height (ft in)		Weight (lbs)	
	H-III	Human	H-III	Human
5 th Female	4'11"	4'9"/4'11"/5'1"	108	92.0/106/117
10 year-old	?	4'2"/4'6"/4'9"	?	52/72.5/112
6 year-old	3'9"	3'7"/3'11"/4'3"	51.6	37.3/47.2/75.6

Concept Definition

- SAE DFTG was asked in early 2000 to develop a 10-year-old
- DFTG accepted the task
- Weight and Height of 10-year-old provided from CDC Data Bank
- DFTG meeting in May 2000 met to define the concept



CDC Children Growth Charts

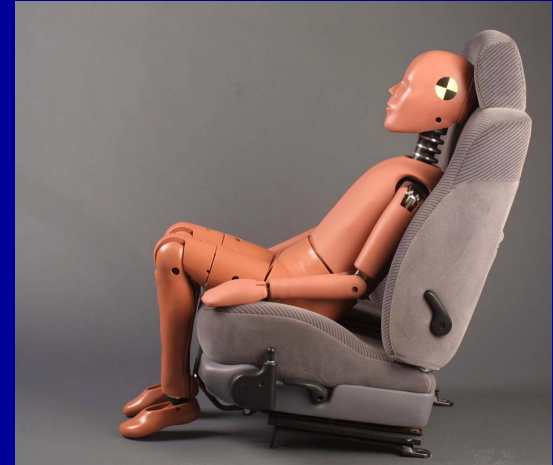
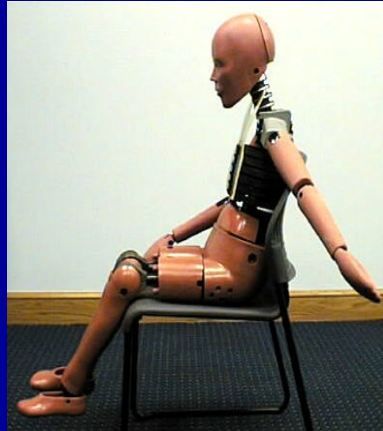
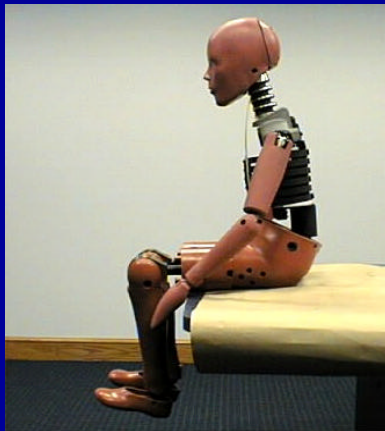
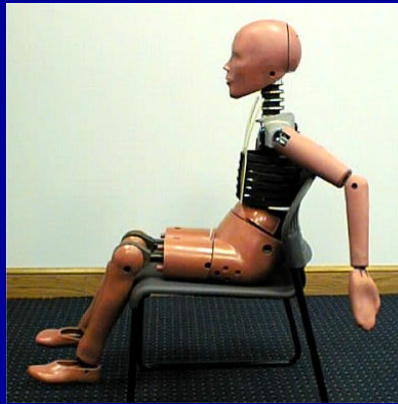


Concept Design Targets



- Dummy Height – 54 in (4'6")
- Dummy Weight – 72 lbs
- Postures
 - Erect seated
 - Slouched seated
 - Standing
 - Kneeling
- Basic Construction – Similar to Small Female

Sitting Postures: *erect, normal, and slouched*



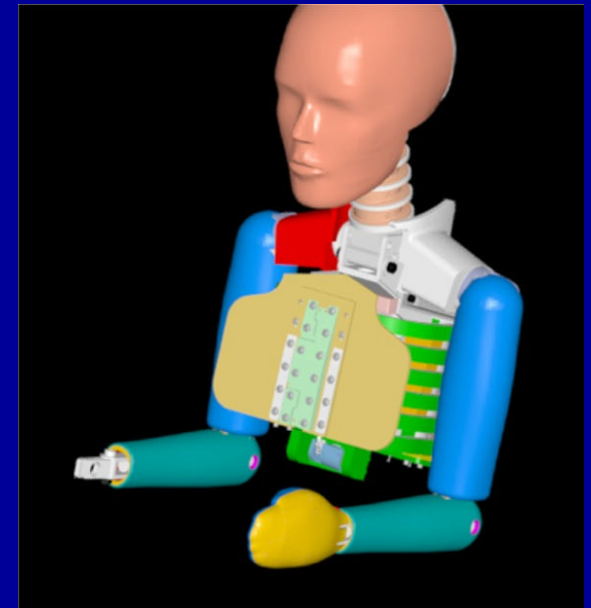
Dummy Development



- DFTG Held first review meeting in June, 2000
- Reviewed impact responses scaled from small female and 6-year-old
- Provisional performance requirements defined
- Anthropometry and mass goals finalized
- Engineering and prototype build:
 - Upper Body: FTSS
 - Lower Body: Denton ATD
- Prototype completion target – Christmas 2000

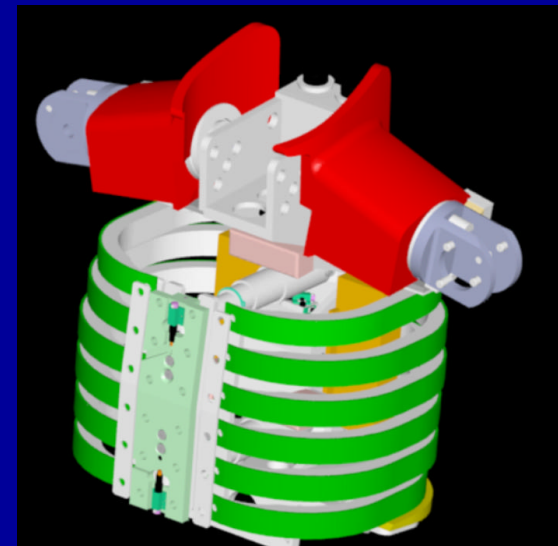
General Construction

- Head (Small Female)
 - Aluminum Skull Casting
 - Vinyl Skin
- Neck
 - Flexible multiple disc molded rubber
 - Center cable
 - Mounted on adjustable lower bracket to accommodate different postures



Construction

- Upper Torso
 - Steel spine and six damped ribs
 - Combined clavicle and scapula
 - Sloped aluminum shoulder
 - Aluminum/nylon sternum and urethane bib
 - Rib-guides to control vertical rib motion
 - Vinyl torso jacket with improved low friction surface finish



Construction



- Lower Torso
 - Lumbar spine (rubber cylinder) with center cable
 - Adjustable lumbar bracket to accommodate different postures
 - Pelvic bone – aluminum casting
 - Pelvis skin- vinyl over urethane foam
 - Pelvis is formed for semi-slouched seated posture

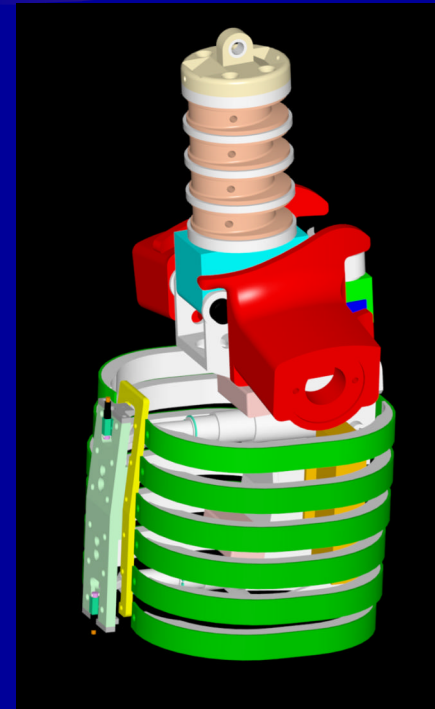
Construction



- Arms – Upper and Lower
 - Steel skeleton
 - Vinyl skin over urethane foam
 - Hands vinyl skin over steel shank
 - Wrist, elbow - hinge joints
- Legs – Upper and Lower
 - Steel skeleton
 - Vinyl skin over urethane foam
 - Feet – vinyl skin over steel skeleton
 - Ankle – ball joint; knee - hinge joint

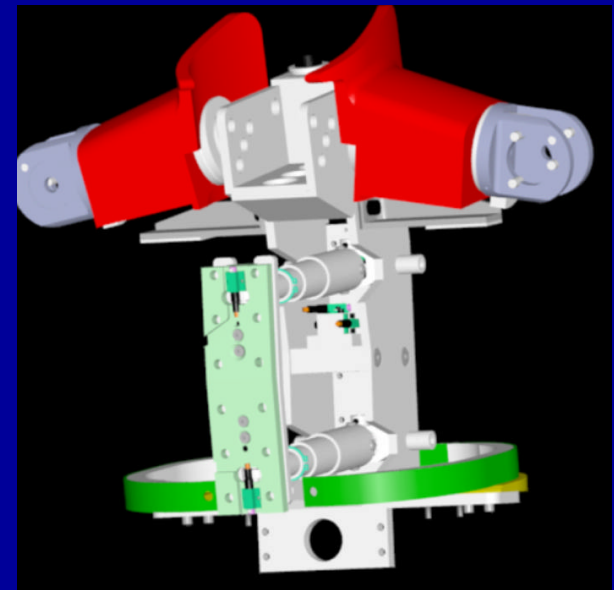
Instrumentation

- Head
 - Triax accelerometers
 - Tilt sensors (optional)
- Neck
 - Six axis upper load cell
 - Six axis lower load cell (optional)
- Shoulder
 - Two axis belt load cell (optional)



Instrumentation

- Thorax
 - Triax accelerometer pack
 - Mid sternum rotary potentiometer
 - Two spine accelerometers (optional)
 - Two accelerometers on the sternum(optional)
 - Two IR-TRACCS deflection sensors (optional)



Instrumentation



- Pelvis
 - Lumbar - six channels load cell (optional)
 - Triax accelerometer pack (optional)
 - Biaxial A.S.I.S load cells (optional)
- Femur
 - Uni-axial load cell
- Tibia
 - Five-axis load cell (optional)

Typical Dimensions



	<u>Design Target</u>	<u>Actual</u>
• Standing Height	54.1 in	52.6 in
• Erect Sitting Height	28.3 in	29.2 in
• Shoulder Breadth	12.9 in	12.9 in
• Shoulder to Elbow	11.3 in	11.8 in
• Chest Depth	6.1 in	6.5 in
• Hip Width	10.2 in	10.4 in
• Buttock to Knee Pivot	17.9 in	18.0 in

Body Segment Target Weights



	Design Target	Actual
• Overall Weight	72+ lb	76.00 lb
• Head assembly	8.1 lb	8.07 lb
• Neck assembly	1.4 lb	1.66 lb
• Upper Torso	15.6 lb	17.69 lb
• Lower Torso	21.1 lb	18.16 lb
• Arms (both)	6.6 lb	7.02 lb
• Legs (both)	18.7 lb	23.40 lb

The Ten Year Old Hybrid III Dummy First Prototype



Current and Projected Status



- First prototype assembled in February 2001
- H-III DFTG review – directed design corrections
- Revised prototype assembled in April 2001
- First drawings completed: April, 2001
- Dummy performance verifications: April – May, 2001
- GM check-out and shake down tests: May – June, 2001
- Agency brief shake down tests: June – July, 2001
- Review of sufficiency: July-August, 2001

Future Plans



- Commercial availability of prototypes: July - August
- Extensive Agency evaluation: August – December, 2001
- If no problems are encountered, incorporation into Part 572 may begin around January 2002
- Projected use: evaluations of booster seats and adult restraints, exploratory use in NCAP
- Estimated uninstrumented dummy cost: \$32k - \$35k
- Estimated instrumentation cost: \$12k - \$50k

